Topic B:

**Functions and Their Graphs**

F-IF.A.1, F-IF.A.2, F-IF.B.4, F-IF.B.5, F-IF.C.7a

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| Focus Standard: | F-IF.A.1 | Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then denotes the output of *f* corresponding to the input . The graph of is the graph of the equation |
|  | F-IF.A.2 | Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. |
|  | F-IF.B.4 | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*.★ |
|  | F-IF.B.5 | Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★ |
|  | F-IF.C.7a | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★   1. Graph linear and quadratic functions and show intercepts, maxima, and minima. |

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| Instructional Days: | 7 |  |
| Lesson 8: | Why Stay with Whole Numbers? | |
| Lesson 9-10: | Representing, Naming, and Evaluating Functions | |
| Lesson 11: | The Graph of a Function | |
| Lesson 12: | The Graph of the Equation | |
| Lesson 13: | Interpreting the Graph of a Function | |
| Lesson 14: | Linear and Exponential Models—Comparing Growth Rates | |

In Lesson 8, students consider that the notation they have been using to write explicit formulas for sequences can be applied to situations where the inputs are not whole numbers. In Lessons 9 and 10, they revisit the notion of function that was introduced in Grade 8. They are now prepared to use function notation as they write functions, interpret statements about functions and evaluate functions for inputs in their domains. They formalize their understanding of a function as a correspondence between two sets, and *,* in which each element of is matched (or assigned) to one and only one element of , and add the understanding that the set is called the *domain*, and the set is called the *range.*

Students study the graphs of functions in Lessons 11-14 of this topic. In Lesson 11, students learn the meaning of the graph of a function, , as the set of all points in the plane, such that is in the domain of and is the value assigned to by the correspondence of the function. Students use plain English language to write the instructions needed to plot the graph of a function. The instructions are written in a way similar to writing computer "pseudo code"—before actually writing the computer programs. In Lesson 12, students learn that the graph of is the set of all points in the plane that satisfy the equation and conclude that it is the same as the graph of the function explored in Lesson 11. In Lesson 13, students use a graphic of the planned landing sequence Mars Curiosity Rover to create graphs of specific aspects of the landing sequence— altitude over time, and velocity over time—and use the graphs to examine the meaning of increasing and decreasing functions. Finally, Lesson 14 capitalizes on students’ new knowledge of functions and their graphs to contrast linear and exponential functions and the growth rates which they model.